Copy for the Elected Office (EO/US) PCT/FI00/00627

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

To:

KOLSTER OY AB
Iso Roobertinkatu 23
P.O. Box 148
FIN-00121 Helsinki
FINLANDE

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

Date of mailing (day/month/year) 09 January 2002 (09.01.02)	
Applicant's or agent's file reference 2990517PC/nu	**IMPORTANT NOTIFICATION**
International application No. PCT/FI00/00627	**International filing date** (day/month/year) 06 July 2000 (06.07.00)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address	State of Nationality	State of Residence
NOKIA NETWORKS OY Keilalahdentie 4 FIN-02150 Espoo Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address	State of Nationality	State of Residence
NOKIA CORPORATION Keilalahdentie 4 FIN-02150 Espoo Finland	FI	FI
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

[X] the receiving Office
[ ] the International Searching Authority
[ ] the International Preliminary Examining Authority
[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Beatriz LARGO
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

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PCT/FI00/00627

PATENT COOPERATION TREATY

10/019235

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92bis.1 and Administrative Instructions, Section 422)

To:

KOLSTER OY AB
Iso Roobertinkatu 23
P.O. Box 148
FIN-00121 Helsinki
FINLANDE

Date of mailing (day/month/year)
10 January 2002 (10.01.02)

Applicant's or agent's file reference
2990517PC/nu

IMPORTANT NOTIFICATION

International application No.
PCT/FI00/00627

International filing date (day/month/year)
06 July 2000 (06.07.00)

1. The following indications appeared on record concerning:

[X] the applicant [ ] the inventor [ ] the agent [ ] the common representative

Name and Address
NOKIA NETWORKS OY
Keilalahdentie 4
FIN-02150 Espoo
Finland

State of Nationality: FI
State of Residence: FI
Telephone No.:
Facsimile No.:
Teleprinter No.:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

[ ] the person [X] the name [ ] the address [ ] the nationality [ ] the residence

Name and Address
NOKIA CORPORATION
Keilalahdentie 4
FIN-02150 Espoo
Finland

State of Nationality: FI
State of Residence: FI
Telephone No.:
Facsimile No.:
Teleprinter No.:

3. Further observations, if necessary:

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[X] the receiving Office
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[ ] the designated Offices concerned
[X] the elected Offices concerned
[ ] other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer
Beatriz LARGO

Telephone No.: (41-22) 338.83.38

RECORD COPY

PCT REQUEST

2990517PC/nu

Original (for **SUBMISSION**) - printed on 06.07.2000 09:03:42 AM

0 0-1	**For receiving Office use only** International Application No.	PCT/FI 0 0 / 0 0 6 2 7
0-2	International Filing Date	0 6 JUL 2000 (0 6 -07- 2000)
0-3	Name of receiving Office and "PCT International Application"	The Finnish Patent Office PCT International Application
0-4 0-4-1	**Form - PCT/RO/101 PCT Request** Prepared using	PCT-EASY Version 2.90 (updated 10.05.2000)
0-5	**Petition** The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	**Receiving Office (specified by the applicant)**	National Board of Patents and Registration (Finland) (RO/FI)
0-7	**Applicant's or agent's file reference**	2990517PC/nu
I	**Title of invention**	NOISE SUPPRESSOR UNIT
II II-1 II-2 II-4 II-5 II-6 II-7	**Applicant** This person is: Applicant for Name Address: State of nationality State of residence	 applicant only all designated States except US NOKIA NETWORKS OY Keilalahdentie 4 FIN-02150 Espoo Finland FI FI
III-1 III-1-1 III-1-2 III-1-4 III-1-5 III-1-6 III-1-7	**Applicant and/or inventor** This person is: Applicant for Name (LAST, First) Address: State of nationality State of residence	 applicant and inventor US only NUUTINEN, Sami 120 Cielo Lane 204 Novato, CA 94949 United States of America FI US

IV-1	**Agent or common representative; or address for correspondence** The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	KOLSTER OY AB
IV-1-2	Address:	Iso Roobertinkatu 23 P.O. Box 148 FIN-00121 Helsinki Finland
IV-1-3	Telephone No.	358 9 618 821
IV-1-4	Facsimile No.	358 9 602 244
IV-1-5	e-mail	kolster@kolster.fi
V	**Designation of States**	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT (patent and utility model) AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ (patent and utility model) DE (patent and utility model) DK (patent and utility model) DM DZ EE (patent and utility model) ES FI (patent and utility model) GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR (patent and utility model) KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK (patent and utility model) SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

PCT REQUEST

2990517PC/nu

Original (for **SUBMISSION**) - printed on 06.07.2000 09:03:42 AM

V-5	**Precautionary Designation Statement** In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.		
V-6	**Exclusion(s) from precautionary designations**	NONE	
VI-1	**Priority claim of earlier national application**		
VI-1-1	Filing date	07 July 1999 (07.07.1999)	
VI-1-2	Number	991558	
VI-1-3	Country	FI	
VI-2	**Priority document request** The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	**International Searching Authority Chosen**	Swedish Patent Office (ISA/SE)	
VIII	**Check list**	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	5	-
VIII-3	Claims	2	-
VIII-4	Abstract	1	2990517p.txt
VIII-5	Drawings	1	-
VIII-7	TOTAL	13	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-9	Separate signed power of attorney	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of Official Action	-
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	English	
IX-1	Signature of applicant or agent	Tapio Äkräs	
IX-1-1	Name	KOLSTER OY AB	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	06 JUL 2000	(06 -07- 2000)

PCT REQUEST

2990517PC/nu

Original (for **SUBMISSION**) - printed on 06.07.2000 09:03:42 AM

10-2 10-2-1 10-2-2	**Drawings:** Received Not received	
10-3	**Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application**	
10-4	**Date of timely receipt of the required corrections under PCT Article 11(2)**	
10-5	**International Searching Authority**	ISA/SE
10-6	**Transmittal of search copy delayed until search fee is paid**	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	**Date of receipt of the record copy by the International Bureau**	

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
2990517PC/or		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/FI00/00627	06.07.2000	07.07.1999
International Patent Classification (IPC) or national classification and IPC7		
H05K 3/30, H01F 27/29		
Applicant		
Nokia Networks OY et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
15.01.2001	26.09.2001
Name and mailing address of the IPEA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 Telex 17978 PATOREG-S	Dan Ionesco / MRo Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI00/00627

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/FI00/00627

V. Reasoned statement under Article 35(2) with regard t novelty, inventive step r industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-10	YES
	Claims		NO
Inventive step (IS)	Claims	1-10	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The documents cited in the International Search Report represent the prior art. The claimed invention stated in claims 1 - 10 is not anticipated by these documents. None of the documents or any relevant combination of them reveal a noise suppressor unit as described by these claims.

According to the arguments stated above, the invention claimed in claims 1 - 10 is novel and considered to involve an inventive step. The industrial applicability of the claimed invention is obvious.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
18 January 2001 (18.01.2001)

PCT

(10) International Publication Number
WO 01/05202 A1

(51) International Patent Classification[7]: H05K 3/30, H01F 27/29

(21) International Application Number: PCT/FI00/00627

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(26) Publication Language: English

(30) Priority Data:
991558 7 July 1999 (07.07.1999) FI

(71) Applicant *(for all designated States except US)*: **NOKIA NETWORKS OY** [FI/FI]; Keilalahdentie 4, FIN-02150 Espoo (FI).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **NUUTINEN, Sami** [FI/US]; 120 Cielo Lane 204, Novato, CA 94949 (US).

(74) Agent: **KOLSTER OY AB**; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).

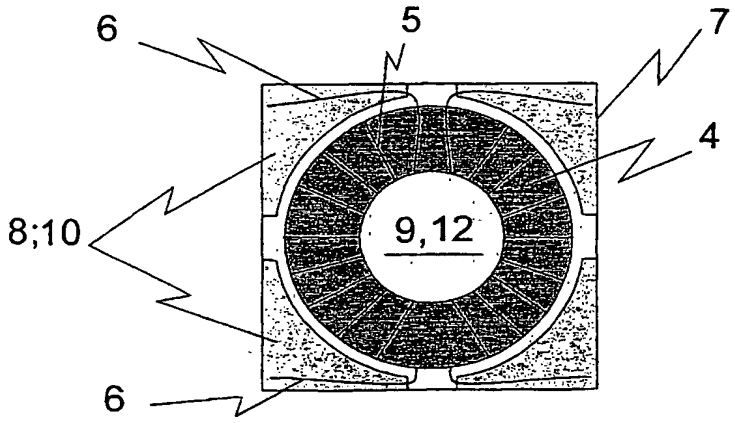
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), DM, DZ, EE, EE (utility model), ES, FI, FI (utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KR (utility model), KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: NOISE SUPPRESSOR UNIT



(57) Abstract: The invention relates to a noise suppressor unit (1) for installing and mounting a common mode choke for a noise suppressor onto a circuit board (3), the common mode choke for the noise suppressor comprising a toroid (4) coiled with at least two coils (5), which coils (5) have two coil ends (6). The noise suppressor unit (1) comprises a circuit board holder (7), onto which the toroid (4) is positioned, the toroid being coiled with at least two coils (5), the circuit board holder (7) comprising connecting plates (8), wherein one coil end (6) at the most is or more coil ends (6) are connected to each connecting plate (8) and wherein the connecting plates (8) are intended to be surface mounted to mounting surface areas in the circuit board (3), and wherein the connecting plates (8) are electrically insulated from each other, and lifting means (9) for an assembly head or the like of an automatic assembly machine for placing the noise suppressor unit (1) onto the circuit board (3) by the automatic assembly machine or the like.

WO 01/05202 A1

NOISE SUPPRESSOR UNIT

BACKGROUND OF THE INVENTION

The invention relates to a noise suppressor unit for installing and mounting a common mode choke for a noise suppressor onto a circuit board, the common mode choke for the noise suppressor comprising a toroid coiled with at least two coils, which coils have two coil ends.

The noise suppressor unit according to the invention can be applied, for example, to installation and mounting of a common mode choke for a noise suppressor in a power source module onto a circuit board of the power source module, the module being arranged onto a circuit board of a plug-in unit. A power source module is a separate current delivery device positioned onto a circuit board of a plug-in unit, the device comprising a circuit board for the power source module. Owing to the structure, which comprises two stacked circuit boards, the power source module only allows the use of especially low components in order for the combination to fit into the card slot reserved for it.

Especially the operation of a power source causes much electromagnetic noise. The European Commission EMC directive (89/336/EEC) on electric devices determines that no device must not be disturbed by other devices nor must it disturb other devices. In the current and future telecommunications community, the fulfilment of the requirements of the directives is of utmost importance, and also constitutes a competitive advantage. If electromagnetic noise cannot be filtered in the power source module, it propagates and may cause malfunction in the plug-in unit. As a result of this, the operation of the entire system may be disturbed. For this reason, for preventing the propagation of noise, the interface between the power source and the plug-in unit must comprise a noise filter having, among other things, a common mode choke for a noise suppressor of the power source module. The operation of the noise filter is reciprocal.

Common mode chokes for noise suppressors have previously been disposed on the circuit board of a plug-in unit. Common mode chokes for noise suppressors have previously been manually positioned onto the circuit board of the plug-in unit, and the ends of the choke coils have been soldered into openings on the circuit board of the plug-in unit.

When components are assembled onto a circuit board by modern

production methods, the above conventional method cannot be used. A common mode choke for a noise suppressor has to be able to be assembled automatically and surface mounted.

BRIEF DESCRIPTION OF THE INVENTION

It is thus an object of the invention to provide a noise suppressor unit to solve the above problems.

The objects of the invention are achieved by a noise suppressor unit, which is characterized in that the noise suppressor unit comprises a circuit board holder, onto which the toroid is positioned, the toroid being coiled with at least two coils, the circuit board holder comprising connecting plates, wherein one coil end at the most is or more coil ends are connected to each connecting plate and wherein the connecting plates are intended to be surface mounted to mounting surface areas in the circuit board, and wherein the connecting plates are electrically insulated from each other, and lifting means for an assembly head or the like of an automatic assembly machine for placing the noise suppressor unit onto the circuit board by the automatic assembly machine or the like.

The preferred embodiments of the invention are disclosed in the dependent claims.

The invention is based on placing and mounting the common mode choke for the noise suppressor onto the circuit board holder so as to achieve a noise suppressor unit which functions as an installation and mounting holder of the common mode choke for the noise suppressor. This circuit board holder provides a common mode choke for a noise suppressor, which is both automatically assembled and surface mounted.

Such packages are commercially available that allow automated assembly and surface mounting of a common mode choke for a noise suppressor, but owing to the two-piece holder+cover structure of the packages, the components become too high and exceed the maximum height allowed for components, especially in cases where the common mode choke for the noise suppressor is a common mode choke for a noise suppressor in a power source module, the choke being positioned onto a circuit board of the power source module arranged onto a circuit board of a plug-in unit. In the noise suppressor unit of the invention the component height does not create a problem, since the circuit board can be made thin.

The noise suppressor unit of the invention also provides the advantage that it has a simple structure; the circuit board holder, for instance, is made of one piece. Owing to the simplicity of the circuit board holder it is advantageous to manufacture.

Due to the circuit board structure and the connecting plates in the circuit board holder, the noise suppressor unit of the invention does not comprise any mounting feet, like the conventional surface mounted/mountable components do, and therefore the surface area taken by the common mode choke for the noise suppressor remains small.

The connecting plates of the circuit board holder cool and efficiently transfer the heat caused by the common mode choke for the noise suppressor to the cooling layers of the circuit board of the power source. Efficient cooling enables the use of the circuit board holder in high-power applications.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention will be described in greater detail in connection with preferred embodiments with reference to the attached drawings, in which

Figure 1 shows a power source module arranged onto a plug-in unit,

Figure 2 is a top view of a noise suppressor unit,

Figure 3 is a bottom view of the noise suppressor unit,

Figure 4 is a side view of the noise suppressor unit.

DETAILED DESCRIPTION OF THE INVENTION

The invention relates to a noise suppressor unit 1 for installing and mounting a common mode choke (not marked with a reference number) for a noise suppressor onto a circuit board 3.

Figure 1 shows a structure in which the circuit board 3 is a circuit board of a power source module, the circuit board being arranged onto a circuit board 2 of a plug-in unit.

The common mode choke for the noise suppressor comprises a toroid 4 coiled with at least two coils 5 such that each coil 5 has two coil ends 6.

The noise suppressor unit 1 comprises a circuit board holder 7, upon which the toroid 4 coiled with at least two coils 5 is positioned.

The circuit board holder 7 comprises connecting plates 8. One coil end 6 at the most is or more coil ends 6 are connected to each connecting plate 8. This means that one or more coil ends 6 can be connected to one connecting plate 8, or no coil end 6 is connected thereto. The connecting plates 8 are also intended to be surface mounted to mounting surface areas, such as copper areas (not shown), on the circuit board 3. The connecting plates 8 are electrically insulated from each other.

The noise suppressor unit 1 further comprises lifting means 9 for an assembly head (not shown) or the like of an automatic assembly machine for placing the noise suppressor unit 1 onto the circuit board 3 by the automatic assembly machine or the like (not shown).

The connecting plates 8 are preferably so dimensioned and designed that the toroid 4 is apart and does not touch the connecting plates 8. Such a solution provides a better functioning noise suppressor unit 1.

Each connecting plate 8 comprises more preferably an upper connecting plate 10, to which one coil end 6 at the most is connected, and a lower connecting plate 11, which is in an electrical connection with the upper connecting plate 10 and which is intended to be surface mounted to conductors in the circuit board 3. The upper connecting plate 10 can, for example, be connected to the lower connecting plate 11 by a circuit board through (not shown).

The circuit board holder 7 is preferably a two-layer circuit board.

In Figure 2, the upper connecting plates 10 are so dimensioned and designed that the toroid 4 is apart and does not touch the upper connecting plates 10. Such a solution provides a better functioning noise suppressor unit 1.

In Figure 3, the lower connecting plates 11 are substantially rectangular.

The upper connecting plates 10 and the lower connecting plates 11 are preferably made as big as possible so as to cool more efficiently and to transfer the heat caused by the common mode choke for the noise suppressor to the cooling layers (not shown) of the circuit board of the power source.

The common mode choke for the noise suppressor shown in Figure 2 comprises two coils 5 and four connecting plates 8.

The circuit board holder 7 shown in the figures is substantially rectangular. Each connecting plate 8 is located at one corner of the circuit board holder 7.

The connecting plates 8 are preferably made of copper or copper metal.

The lifting means 9 are preferably in the middle opening 12 of the toroid 4 and preferably on the surface of the circuit board holder 7. This solution provides a simple noise suppressor unit 1.

The noise suppressor unit 1 of the invention is assembled and mounted onto the circuit board 3 for example in the following manner. The lifting means 9, from which a strainer of the assembly machine grabs the noise suppressor unit 1, are in the middle opening 12 of the toroid 4 on the surface of the circuit board holder 7. The diameter of the strainer (not shown) of the assembly machine can be about a half of the diameter of the middle opening 12 of the toroid 4. During assembling the strainer of the assembly machine is pushed into the middle opening 12 of the toroid 4 and grabs the upper surface of the circuit board holder 7 for example with its suction head and transfers the noise suppressor unit 1 from a component pallet (not shown) to the circuit board 3. On the circuit board 3 of the power supply module, each connecting plate 8 of the noise suppressor unit 1 is connected to a corresponding copper surface area (not shown) on the circuit board 3 by means of a copper joint, for example. Thus, each coil end 6 of the common mode choke for the noise suppressor has the same electric potential as the corresponding copper surface area at the bottom of the noise suppressor unit 1 of the invention.

It is obvious to those skilled in the art that as technology advances, the basic idea of the invention may be implemented in a variety of ways. Accordingly, the invention and its embodiments are not restricted to the above-described examples, but may vary within the scope of the claims.

CLAIMS

1. A noise suppressor unit (1) for installing and mounting a common mode choke for a noise suppressor onto a circuit board (3), the common mode choke for the noise suppressor comprising a toroid (4) coiled with at least two coils (5), which coils (5) have two coil ends (6),

characterized in that the noise suppressor unit (1) comprises

a circuit board holder (7), onto which the toroid (4) is positioned, the toroid being coiled with at least two coils (5),

the circuit board holder (7) comprising connecting plates (8), wherein one coil end (6) at the most is or more coil ends (6) are connected to each connecting plate (8) and wherein the connecting plates (8) are intended to be surface mounted to mounting surface areas in the circuit board (3), and wherein the connecting plates (8) are electrically insulated from each other, and

lifting means (9) for an assembly head or the like of an automatic assembly machine for placing the noise suppressor unit (1) onto the circuit board (3) by the automatic assembly machine or the like.

2. A noise suppressor unit as claimed in claim 1, **characterized** in that the connecting plates (8) are so dimensioned and designed that the toroid (4) is apart from the connecting plates (8).

3. A noise suppressor unit as claimed in claim 1, **characterized** in that each connecting plate (8) comprises an upper connecting plate (10), to which one coil end (6) at the most is connected, and a lower connecting plate (11), which is in an electrical connection with the upper connecting plate (10) and which is intended to be surface mounted to mounting surface areas in the circuit board (3).

4. A noise suppressor unit as claimed in claim 3, **characterized** in that the upper connecting plates (10) are so dimensioned and designed that the toroid (4) is apart from the upper connecting plates (10).

5. A noise suppressor unit as claimed in claim 3, **characterized** in that the lower connecting plates (11) are substantially rectangular.

6. A noise suppressor unit as claimed in claim 1, **characterized** in that it comprises two coils (5) and four connecting plates (8).

7. A noise suppressor unit as claimed in claim 6, **character-**

i z e d in that the circuit board holder (7) is substantially rectangular and that each connecting plate (8) is located at one corner of the circuit board holder (7).

8. A noise suppressor unit as claimed in claim 1, **c h a r a c t e r - i z e d** in that the connecting plates (8) are made of copper or copper metal.

9. A noise suppressor unit as claimed in claim 1, **c h a r a c t e r - i z e d** in that the lifting means (9) are in the middle opening (12) of the toroid (4)

10. A noise suppressor unit as claimed in claim 9, **c h a r a c - t e r i z e d** in that the lifting means (9) are on the surface of the circuit board holder (7).

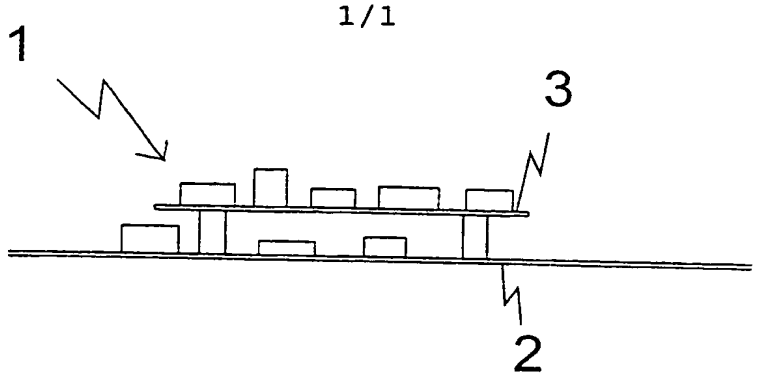


FIG 1

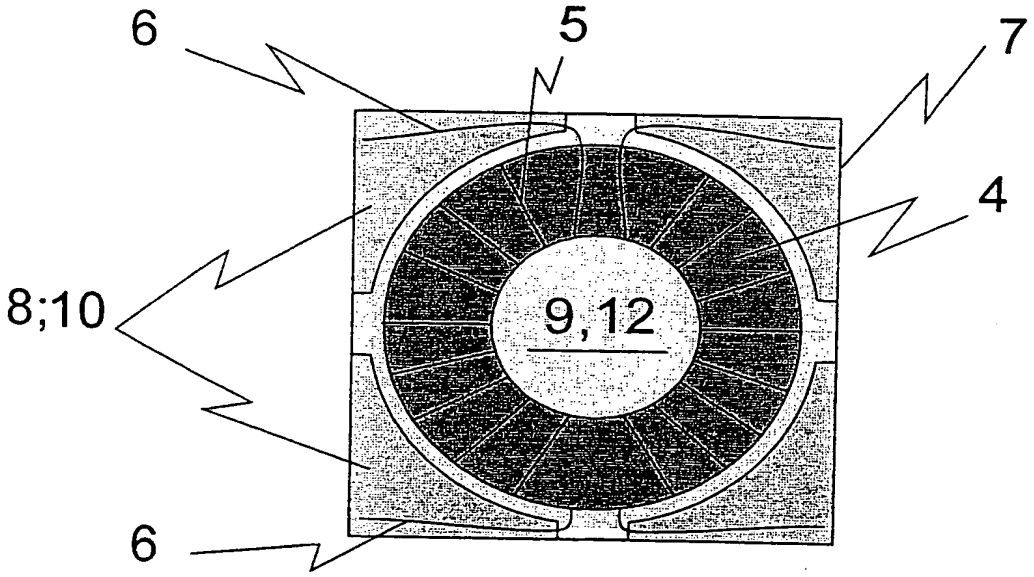


FIG 2

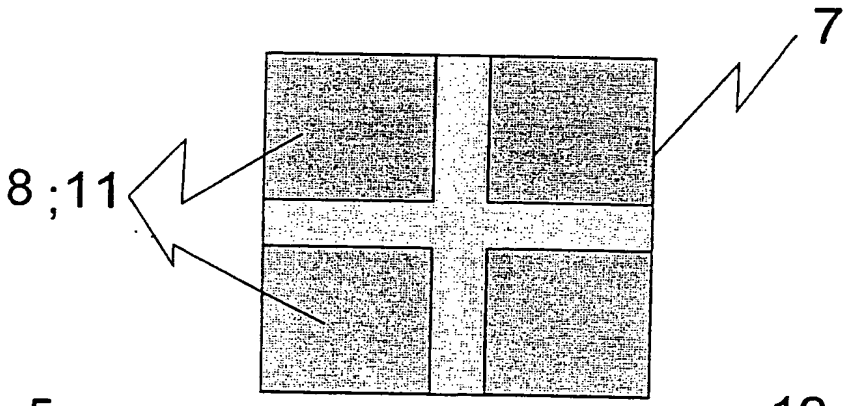


FIG 3

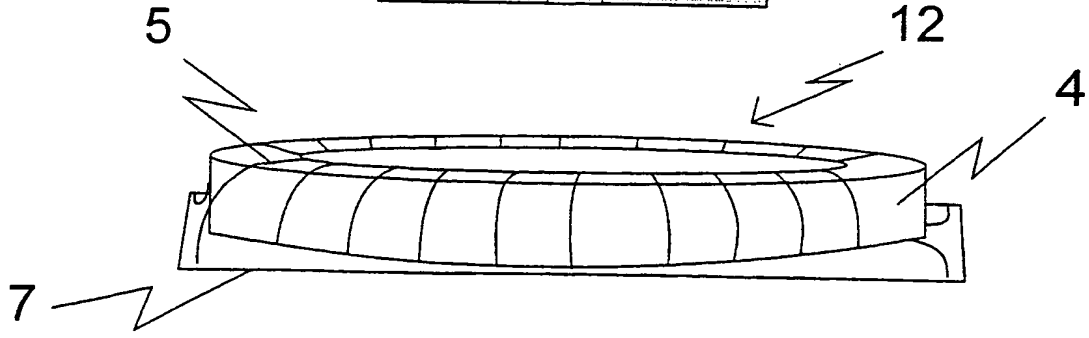


FIG 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 00/00627

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H05K 3/30, H01F 27/29
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H05K, H01F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 6-260341 A (FUJI ELELCTROCHEM CO LTD), 16 Sept 1994 (16.09.94) --	1-10
A	Patent Abstracts of Japan, abstract of JP 6-260341 A (fuji elelctrochem co ltd), 16 Sept 1991 (16.09.91) --	1-10
A	JP 7-78719 A (FUJI ELELCTROCHEM CO LTD), 20 March 1995 (20.03.95) --	1-10
A	Patent Abstracts of Japan, abstract of JP 7-78719 A (fuji elelctrochem co ltd), 20 March 1995 (20.03.95) --	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 October 2000	02 -11- 2000
Name and mailing address of the ISA/ Sw dish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer S-E Bergdahl / JA A Telephone No. +46 8 782 25 00

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JP	6-260341	A	16/09/94	NONE
JP	7-78719	A	20/03/95	NONE